

D. PHYSICAL SCIENCE

<p>Content Standard: Students in Wisconsin will demonstrate an understanding of the physical and chemical properties of matter, the forms and properties of energy, and the ways in which matter and energy interact.</p> <p>Rationale: Knowledge of the physical and chemical properties of matter and energy is basic to an understanding of the earth and space, life and environmental, and physical sciences. The properties of matter can be explained in terms of the atomic structure of matter. Natural events are the result of interactions of matter and energy. When students understand how matter and energy interact, they can explain and predict chemical and physical changes that occur around them.</p>			
Performance Standards: By the end of grade four students will:	Sample Alternate Performance Indicators: (1-3 per standard)	Sample Performance Activities/Tasks: (1-2 per indicator)	Sources of Data
D.4.1. Understand that objects are made of more than one substance, by observing, describing, and measuring the properties of earth materials, including properties of size, weight, shape, color, temperature, and the ability to react with other substances [1]	1. Identify properties of earth materials [1] 2. Observe and describe earth materials [1] 3. Measure properties of earth materials [1]	1.a. Collect a variety of earth materials(1) 1.b. List the properties that make them different from one another(1) 2.a. Observe an object and describe it through words, pictures, or semantic maps(1) 3.a. Measure an object's size, weight, shape, temperature, color, and its ability to react with other substances(1)	
D.4.2. Group and/or classify objects and substances based on the properties of earth materials[2]	1. Group objects according to similar properties[2] 2. Group pictures of objects according to similar properties[2] 3. Identify the category or name of a object or substance[1]	1.a. Group objects by size, weight, shape, color, and physical state(2) 2.a. Group pictures of objects by size, weight, shape, color, and physical state(2) 3.a. After sorting, select the name of the group from a list, and respond yes/no to the name of the group(1)	
D.4.3. Understand that substances can exist in different states—solid, liquid, gas[1]	1. Review examples to understand the states of solid, liquid, and gas[1]	1.a. Experiment with solid, liquid, and gas using real-world examples(1)	

	2. Sort and label items as solid, liquid, and gas[2]	2.a. Given substances, group them as solid, liquid and gas(2)	
D.4.4. Observe and describe changes in form, temperature, color, speed, and direction of objects and construct explanations for the changes[2]	1. Observe changes in form, temperature, color, speed, and direction of objects[2] 2. Describe changes that occur in objects[2] 3. Explain why changes occur[2]	1.a. Observe changes in water as it freezes, melts, and evaporates(2) 2.a. List changes (using drawing, word map, or discussion) that occur as water freezes, melts, and evaporates(1) 3.a. Explain changes through drawings or other visuals (2)	
D.4.5. Construct simple models of what is happening to materials and substances undergoing change, using simple instruments or tools to aid observations and collect data[2]	1. Observe and collect data about change using simple instruments or tools[1] 2. Construct simple models of what happen to materials and substances undergoing change[2]	1.a. Use simple tools (e.g., thermometer, scale, rules, hand lenses, and fan) to observe and measure changes in water as it freezes, melts, and evaporates (1) 2.a. Use simple models or other visuals to display the changes that occur in water(2)	
D.4.6. Observe and describe physical events in objects at rest or in motion[1]	1. Observe objects at rest and in motion[1] 2. Describe objects at rest and in motion[2]	1.a. Experiment with objects at rest or in motion(2) 2.a. Construct a demonstration to show the physical events of objects at rest and in motion(2)	
D.4.7. Observe and describe physical events involving objects and develop record-keeping systems to follow these events by measuring and describing changes in their properties, including position relative to another object, motion over time, and position due to forces[2]	1. Observe and describe physical events involving objects and develop record-keeping systems to follow these events[2]	1.a. Experiment with objects at rest or in motion, and keep a journal (picture or word) of all changes(2)	
D.4.8. Ask questions and make observations to discover the differences between substances	1. Identify prior knowledge related to the topic[1]	1.a. List objects that can be touched and objects cannot be touched(1)	

that can be touched (matter) and substances that cannot be touched (forms of energy, light, heat, electricity, sound, and magnetism)[2]	2. Make observations of the relevant characteristics of variables during experimentation[2]	2.a. Participate in activities involving substances that can be touched and substances that cannot be touched(1) 2.b. Create a visual (e.g., discussion web or Venn diagram) to display the differences between substances that can be touched and substances that cannot be touched(2)	
<i>Performance Standards: By the end of grade eight students will:</i>	<i>Sample Alternate Performance Indicators: (1-3 per standard)</i>	<i>Sample Performance Activities/Tasks: (1-2 per indicator)</i>	<i>Sources of Data</i>
D.8.1. Observe, describe, and measure physical and chemical properties of elements and other substances to identify and group them according to properties such as density, melting points, boiling points, conductivity, magnetic attraction, solubility, and reactions to common physical and chemical tests[2]	1. Classify objects according to similar physical properties[2] 2. Classify objects according to similar chemical properties[2] 3. Identify and group objects according to similar chemical and physical properties[2]	1.a. Use a graphic organizer to group objects by mass, weight, volume, physical state, density, color, texture, hardness, magnetic attraction, and conductivity(2) 2.a. Use a graphic organizer to group objects by chemical properties(2) 3.a. Use a graphic organizer to group objects by chemical and physical properties(2)	
D.8.2. Use the major ideas of atomic theory and molecular theory to describe physical and chemical interactions among substances, including solids, liquids, and gases[1]	1. Distinguish between elements, compounds, or mixtures[2] 2. Demonstrate that atoms are composed of smaller particles called protons, neutrons, and electrons[1] 3. Know that atoms in solids are close together and don't move about easily. Atoms in liquids are close to each other but move about easily. Atoms in gases are quite far apart and move about freely[1]	1.a. Classify substances as elements, compounds or mixtures(2) 2.a. Use drawings to compare the atoms of various elements in terms of the particle composition and arrangement (2) 3a. Observe molecular movement in three beakers of water and determine if each beaker is hot, warm, or cold(2/3) 3.b. Submit a design for a driveway that won't crack because of expansion or contraction(3)	
D.8.3. Understand how chemical interactions and behaviors lead	1. Understand that the properties of compounds differ from the properties	1.a. Compare properties of individual elements to the properties of compounds containing the elements(2)	

to new substances with different properties[2]	of elements[2]		
D.8.4. While conducting investigations, use the science themes to develop explanations of physical and chemical interactions and energy exchanges[3]	1. While conducting investigations use the science themes (change, constancy, evidence, and measurement) to develop explanations[3]	1.a. Design paper airplanes and explain which modifications produced the best flight results(3)	
D.8.5. While conducting investigations, explain the motion of objects by describing the forces acting on them	1. Understand the concept of inertia (Newton's first law)[1] 2. explain how the forces of friction and gravity affect the motion of objects[2]	1.a. Explain the relationship between wearing a seatbelt and inertia(2) 2.a. Using a pendulum, design an experiment to measure gravity's effect (3) 2.b. Use a ball on a ramp to investigate and measure motion in terms of speed, distance, and time(2)	
D.8.6. While conducting investigations, explain the motion of objects using concepts of speed, velocity, acceleration, friction, momentum, and changes over time, among others, and apply these concepts and explanations to real-life situations outside the classroom[3]	1. Use the concepts of speed, velocity, acceleration, friction, and momentum to explain the motion of objects[3]	1.a. Use a concept definition map to explain speed, velocity, acceleration, friction, and momentum(1/2) 1.b. Find or draw pictures illustrating the concepts of speed, velocity, acceleration, friction, and momentum(1/2) 1.c. Design an investigation to show the relationship between speed, velocity, acceleration, and momentum(3)	
D.8.7. While conducting investigations of common physical and chemical interactions occurring in the laboratory and the outside world, use commonly accepted definitions of energy and the idea of energy conservation[2]	1. Conduct an experiment to verify substances within a closed system interact with one another the total mass of the remains the same no matter how atoms are arranged (Law of Conservation of Matter)[2]	1.a. Conduct an experiment resulting in a chemical change and compare the mass of the substance before and after the reaction (e.g., burn a marshmallow in a closed container)(2) 1.b. Compare, record and explain what happens to an ice cube once it melts, refreezes, and melts again. Measure the mass before and after. Use drawings(2)	

D.8.8. Describe and investigate the properties of light, heat, gravity, radio waves, magnetic fields, electrical fields, and sound waves as they interact with material objects in common situations[1]	<p>1. Describe and investigate light[2]</p> <p>2. Describe and investigate the electromagnetic spectrum (such as gamma, x-ray, ultraviolet, and infrared)[2]</p> <p>3. Describe and investigate that vibrations move at different speeds in different materials[2]</p> <p>4. Demonstrate that electric current can produce magnetic forces, and magnets can cause electric currents[2]</p>	<p>1.a. Use a prism to separate light into component wavelengths(1)</p> <p>1.b. Compare and contrast light refraction through various substance(2)</p> <p>2.a. Compare the effects of various types of electromagnetic radiation(2)</p> <p>3.a. Design an investigation to show the effects of different materials on the speed of radio or sound waves (3)</p> <p>4.a. Construct an electromagnet(2)</p>	
D.8.9. Explain the behaviors of various forms of energy by using the models of energy transmission, both in the laboratory and in real-life situations[2]	1. Explain the behaviors of energy resources (solar, fossil fuels, hydroelectric, geothermal, wind, nuclear, and tidal),using models of energy transmission[2]	1.a. Compare the advantages and disadvantages of various energy types (2)	
D.8.10. Explain how models of the atomic structure of matter have changed over time, including historical models and modern atomic theory	1. Explain how models of the atomic structure of matter have changed over time, including historical models and modern atomic theory (same as performance standard)[1]	1.a. Construct a model of the atomic structure of matter based on modern atomic theory and a second model based on earlier atomic theory(1)	
Performance Standards: By the end of grade four students will:	Sample Alternate Performance Indicators: (1-3 per standard)	Sample Performance Activities/Tasks: (1-2 per indicator)	Sources of Data

D.12.1. Describe atomic structure and the properties of atoms, molecules, and matter during physical and chemical interactions	<p>1. Describe the atomic structure of atoms</p> <p>2. Describe the atomic structure of atoms, molecules and matter during chemical changes</p>	<p>1.a. Compare atoms of various elements in terms of particle composition and arrangement</p> <p>2.a. Identify physical then chemical changes that occur when cookies are mixed then baked</p>	
D.12.2. Explain the forces that hold the atom together and illustrate how nuclear interactions change the atom	<p>1. Explain the forces holding the atom together</p> <p>2. Explain how nuclear interactions change an atom</p>	<p>1.a. Identify that atoms consist of isotopes</p> <p>2.a. Consider the implications for radioactive wastes</p>	
D.12.3. Explain exchanges of energy in chemical interactions and exchange of mass and energy in atomic/nuclear reactions	<p>1. Explain exchanges of energy in chemical interactions</p> <p>2. Explain the exchange of mass and energy in atomic reactions</p>	<p>1.a. Mix cookie batter and identify the ingredients. Bake and identify the chemical changes. Observe and draw the baking process</p> <p>2.a. Watch a video of the sun. Identify that the sun is mass and this mass is converted into energy. Compare the sun to other forms of energy</p>	
D.12.4. Explain how substances, both simple and complex, interact with one another to produce new substances	1. Explain how simple substances interact with one another to produce new substances	1.a. Identify the processes involved in mixing many common beverages	
D.12.5. Identify patterns in chemical and physical properties and use them to predict likely chemical and physical changes and interactions	1. Identify patterns in physical properties and use these patterns to predict likely chemical or physical changes	1.a. Identify the physical properties of lemon juice and a penny. Observe the changes in the penny after treatment with lemon juice. Make before and after drawings of the penny	
D.12.6. Through investigations, identify the types of chemical interactions, including endothermic, exothermic, oxidation, photosynthesis, and acid/base reactions	<p>1. Through investigations, identify oxidation</p> <p>2. Through investigation, identify acid/base reactions</p>	<p>1.a. Distinguish between fast oxidation, as in combustion, and slow oxidation, as in rusting</p> <p>2.a. Mix acid and base solutions back and forth to observe one neutralizing the properties of the other</p>	

D.12.7. Qualitatively and quantitatively analyze changes in the motion of objects and the forces that act on them and represent analytical data both algebraically and graphically	1. Analyze changes in the motion of objects and represent the data graphically	1.a. Compare the “streamlining” effect of various non-motorized, non-propelled vehicles traveling down a ramp and record the results on a graph	
D.12.8. Understand the forces of gravitation, the electromagnetic force, intermolecular force, and explain their impact on the universal system	1. Understand gravitational forces 2. Understand electromagnetic force	1.a. Drop two objects of various weights to observe that all objects fall at the same rate 1.b. Understand that thrust is necessary to escape gravity 2.a. Observe the properties of a permanent magnet 2.b. Observe, test, and chart the materials attracted to a magnet. Use a magnet, a piece of clear plastic, and iron filings to observe the magnetic field’s pattern	
D.12.9. Describe models of light, heat, and sound and through investigations describe similarities and differences in the way these energy forms behave	1. Describe models of light and, through investigation, describe similarities and differences in this energy form’s behavior 2. Describe models of sound and, through investigation, describe similarities and differences in this energy form’s behavior 3. Describe models of light, heat, and sound and, through investigations, describe similarities and differences in these energy forms’ behaviors	1.a. Observe transparent, translucent and opaque surfaces 2.a. Observe how diffraction can be constructive or destructive in nature by observing the Doppler effect of sound 3.a. Explain the similarities and differences of members of the electromagnetic spectrum	
D.12.10. Using the science themes, illustrate the law of conservation of energy during chemical and nuclear reactions	1. Using the science themes, illustrate the law of conservation of energy during a chemical reaction	1.a. In a closed container, burn a marshmallow. Compare the substance’s mass before and after the reaction	

D.12.11. Using the science themes, explain common occurrences in the physical world	1. Use science themes to explain common occurrences in the physical world	<p>1.a. Use recent periodicals or the Internet to explain how social issues affect science and technology</p> <p>1.b. Jigsaw (cooperative learning) how scientific advances can challenge people's beliefs, then advocate the student's belief to the group</p>	
D.12.12. Using the science themes and knowledge of chemical, physical, atomic, and nuclear interactions, explain changes in materials, living things, earth's features, and stars	1. Using science themes and knowledge of physical interactions, explain changes in the earth's features	1.a. Using science themes and knowledge of physical interactions, explain changes in the earth's features	